

Long term monitoring of Water characteristic of three restored southern marshes during the years 2005, 2006,2007 and 2008

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Abstract:

The Water characteristic of the southern marshes (Al-Huwaza,East Hammar and West Hammar) were studied during the years 2005,2006,2007 & 2008. Water temperature ,dissolved oxygen (DO),total dissolved solids (TDS),salinity ,pH ,nitrate and Phosphate. PCA reveals that factors effecting water characteristic in Al-Huwaza marsh were in first rank were water temperature ,TDS and dissolved oxygen. In West Hammar marsh total dissolved salts (TDS),dissolved oxygen and water temperature were the most important factors controlling water characteristic,while Water temperature ,TDS and dissolved oxygen were most important factors affecting the water characteristic of East Hammar marsh.

1-Introduction :

Water is most important component of marshes ,without it no wetlands environment existed . The quality ,quantity and periodicity of inundation decided the type of marshes and consequently the prevailing environment.

During the nineties of last century planned desiccation performed through shifting of the water resources mainly the major rivers Tigris ,Euphrates and Shatt Al-Arab from the marshes resulting in disappearing of more than 90% of marshes environment ,only a small part remain that saddling the board with Iran at Al-Huwaza marsh .

The southern marshland of Iraq, represent the most important phase-geographical unit in southern Mesopotamia and formed a unique environment in the middle east and south western Asia (Hussain

1992). The marshes of southern Iraq is the only populated marshes around the world ,consequently their available water resources are used for several purpose namely drinking ,farming ,livestock watering and on top of that the unique wetland environment. The quality and quantity of water are the decisive factors in wetland , with it no marshes existed .On the other hand decide the type of wetland if they are openness or riparian marsh and kind of wetland environment either freshwater or oligosaline.

Water characteristic of the marshes before desiccation were reviewed by Hussain and Grabe (2009) , stated that salinity increase with progressive time, high oxygen level and slightly alkaline .High density of macrophyte help deposition of suspended solids. Nitrate was the limiting factor for phytoplankton growth and the dominate phase

of inorganic nitrogen but with lower concentration in comparison with other inland water bodies .

Several studied were published concern with water quality of the restored southern marshes after more than decay of desiccation like ,Richardson *et al.*, (2005) ,Neghamish and Ali (2005), Richardson and Hussain (2006) , Taher *et al.*, (2007) , Mahmood *et al.*, (2008) ,AL-Hadiary(2009)Al-Saad *et al.*, (2009), , and Al-Gunzawi (2009) and Al-

Imara *et al.*, (2009 a &b). Al-Saad *et al.*, (2010).

2-Material and methods:

The southern Iraqi wetlands ranged from 8,000 to 25,000 km², making them the largest wetland ecosystem in the Middle East (Partow,2001 ; UNEP 2004)(Fig.1).

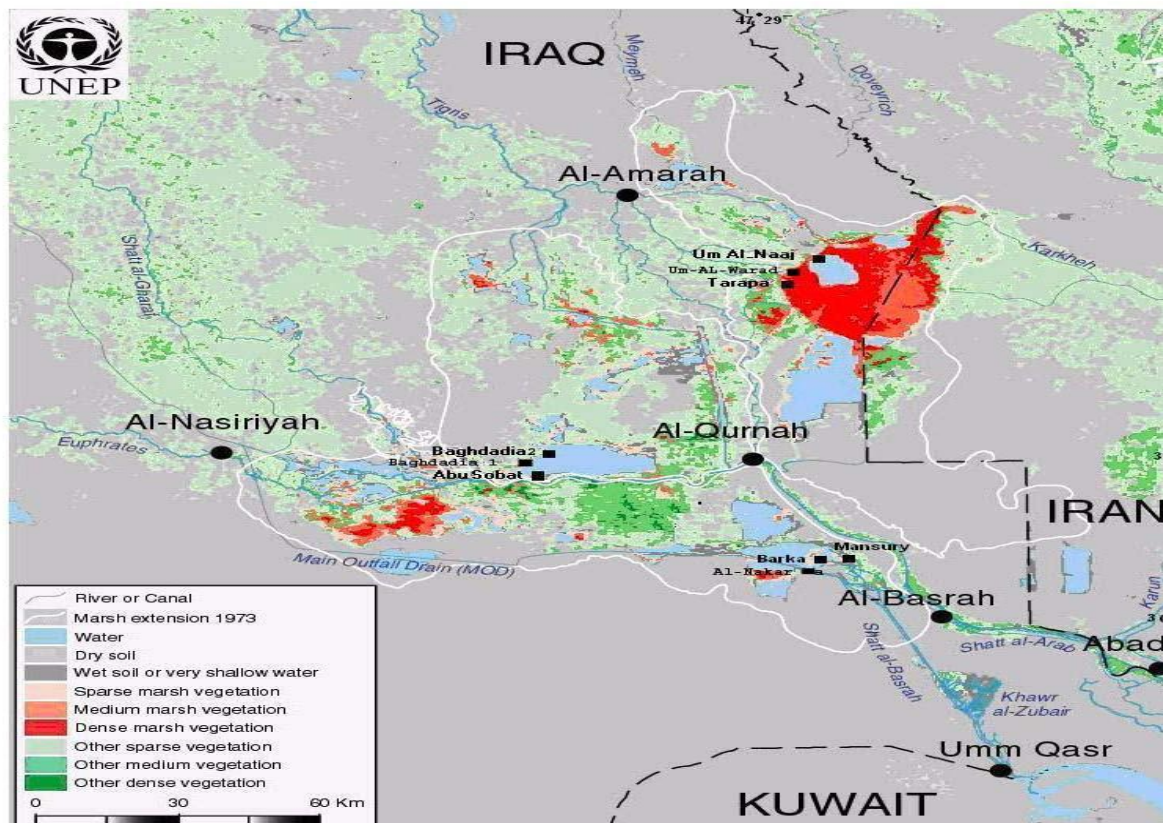


Fig.1: The southern marshes of Iraq showing the three studed restored marshes

The basic data used were derived from reports IMRP(2006) ARDI (2006), and FAO (2008).Data were collected from three major marshes in

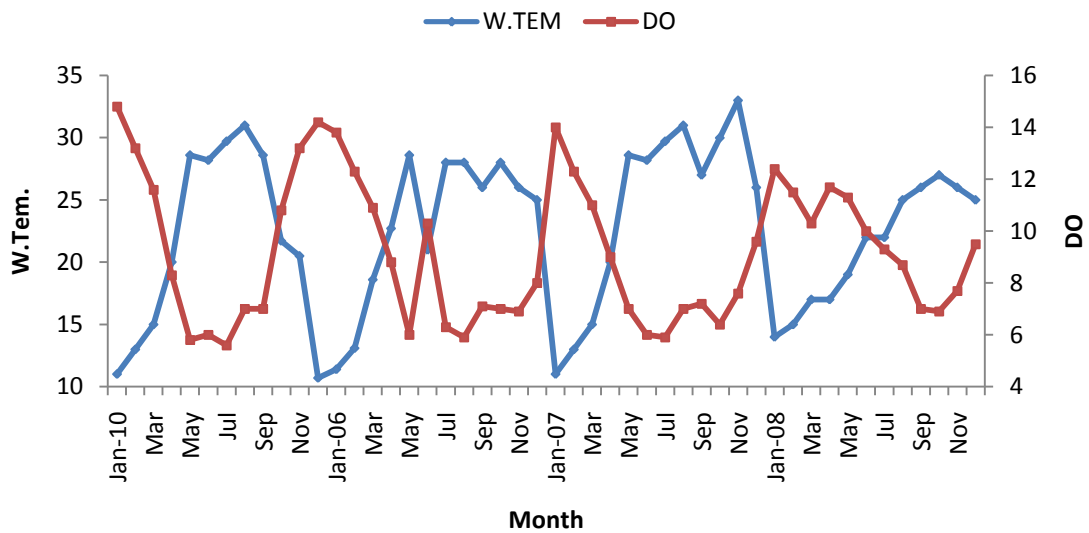
southern Iraq included Al-Huwaza ,West Hammar and East Hammar and from the same stations as followed

Marsh	Station	GPS	Status
Huweyza	Um Alnaaj	N 31 38 30 E 47 35 21	Natural station
Huweyza	Taraba	N 31 29 48 E 47 31 48	Desiccated station
Suq Al Shuyaok	Amia	N 30 51 41 E 46 38 13	Desiccated station
Suq Al Shuyaok	Al Wineas	N 39 51 50 E 46 40 42	Desiccated station
East Al-Hammer	Saddah	N 30 40 04 E 47 38 06	Natural station
East Al-Hammer	Burkah	N 30 40 22 E 47 33 03	Desiccated station

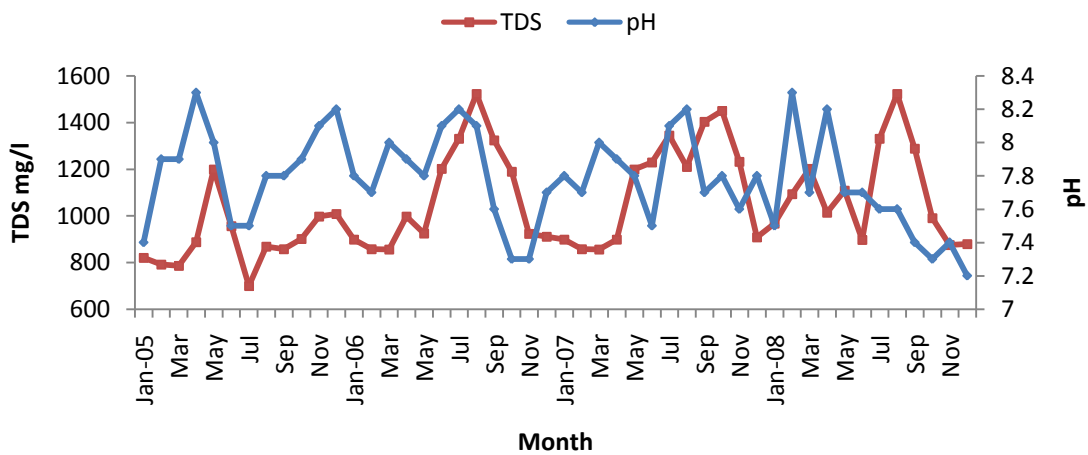
Data were treated and drawn by Axial & CANOCO version 4.5 program/ Principal component Analysis .

Results:

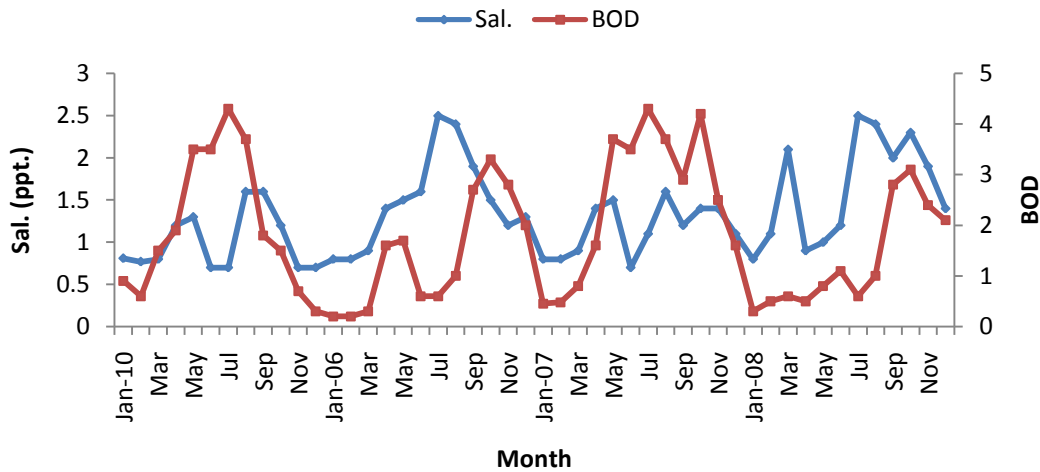
1-Water characteristic of Al-Huwaza marsh.



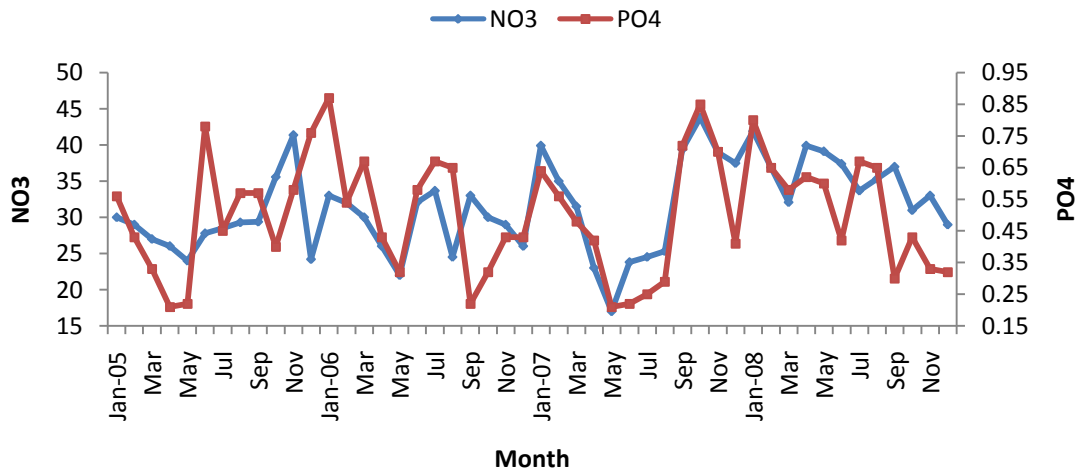
Fig(2): The relationship between dissolved oxygen and water temperature in Al- Huwaza restored marsh during the years 2005,2006,2007 and 2008



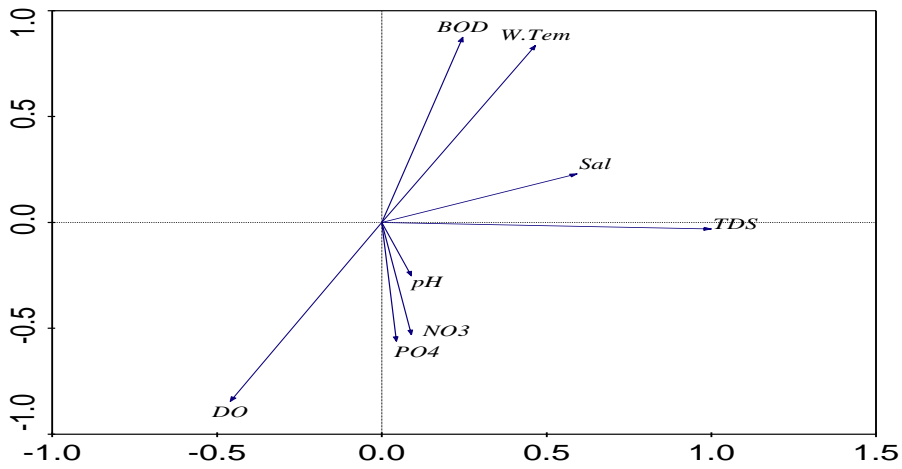
Fig(3). The relationship between pH and total dissolved solids (TDS) in Al- Huwaza restored marsh during the years 2005,2006,2007 and 2008



Fig(4): The relationship between Salinity (Sal) and Biological Oxygen Demanded (BOD) in Al- Huwaza restored marsh during the 2005,2006,2007 and 2008

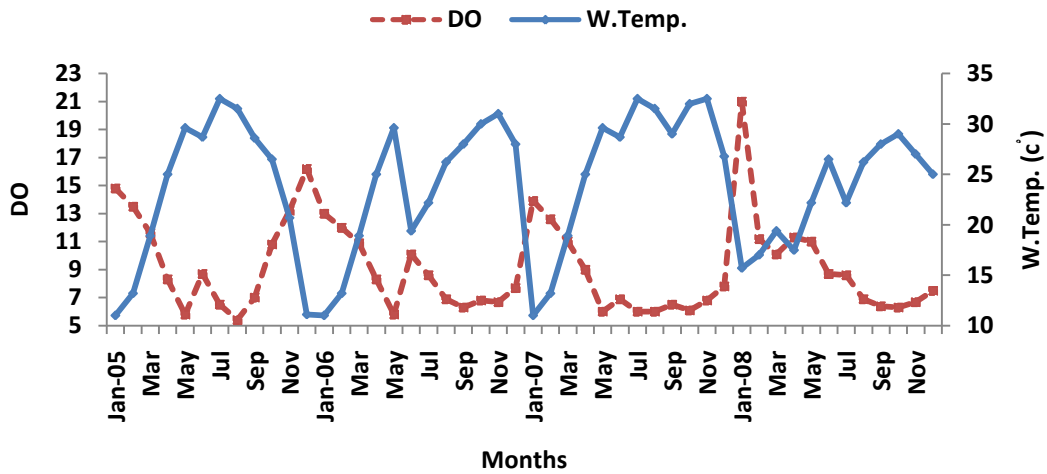


Fig(5):The relationship between Nitrate and Phosphate in the Al- Huwaza restored marsh during the years 2005,2006,2007 and 2008

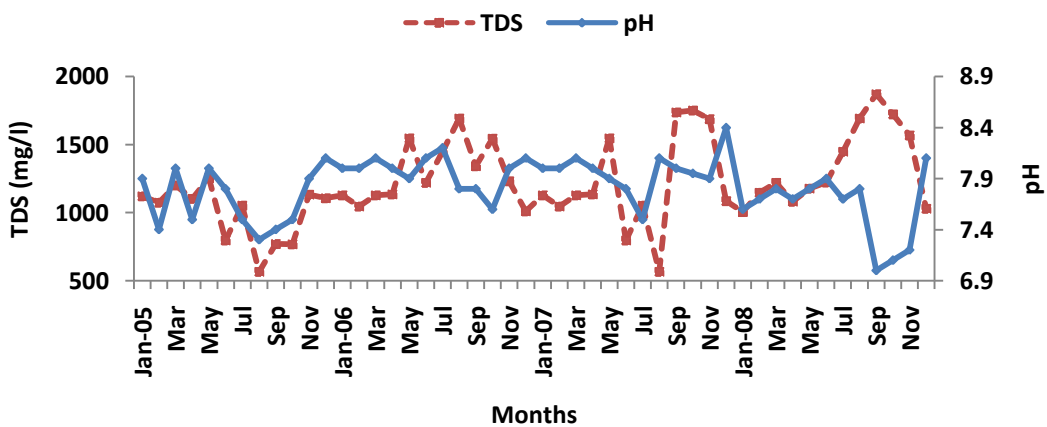


Fig(6) :The relation between different parameters by using Principal component analysis in Al- Huwaza marsh during the years 2005,2006,2007 and 2008

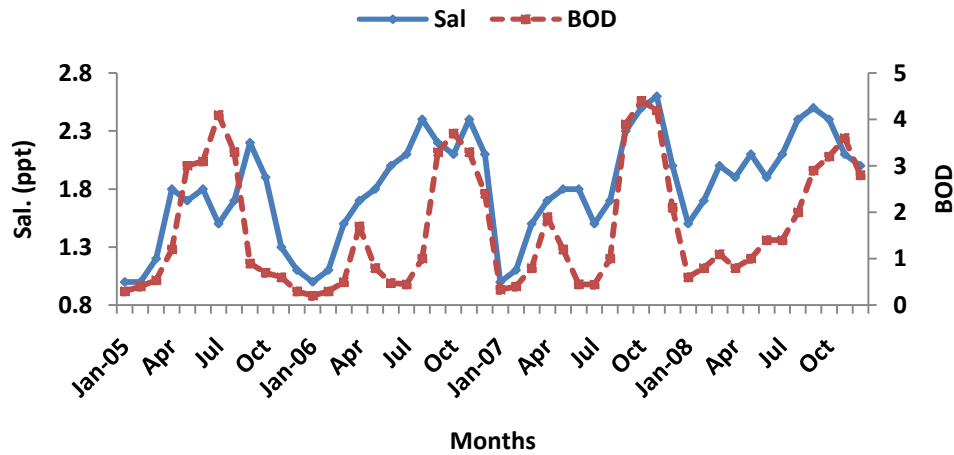
2- Water characteristic of West Hammar marsh



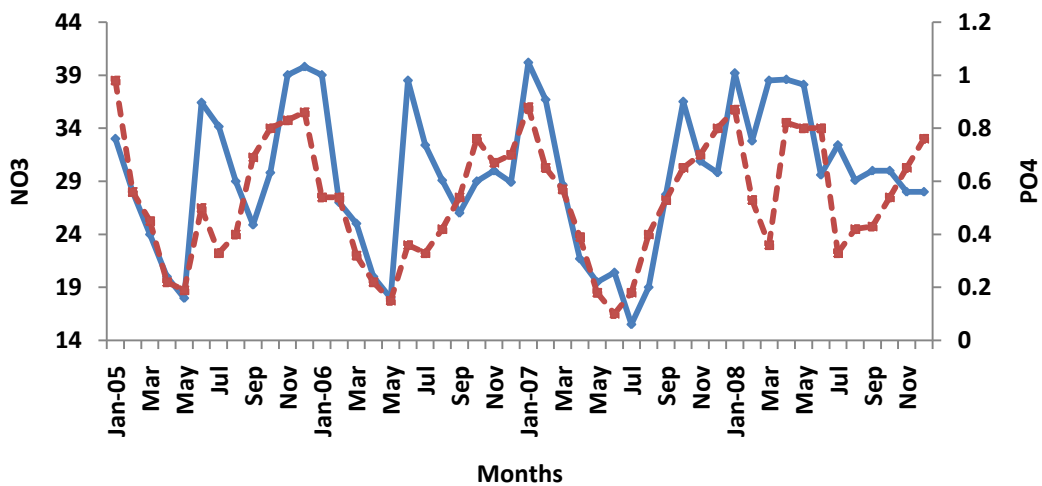
Fig(7)) in west Hammar restored marsh during the years 2005,2006,2007 and 2008



Fig(8):The Relationship between pH and total dissolved solids (TDS) in west Hammar restored marsh during the years 2005,2006,2007 and 2008



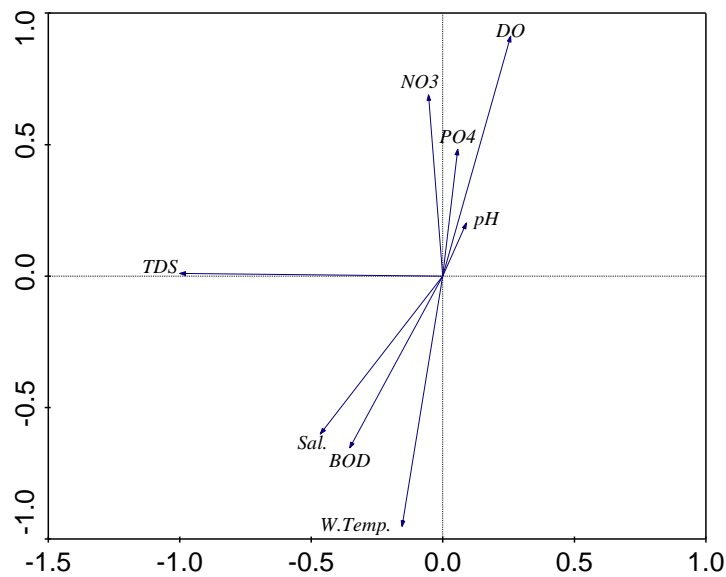
Fig(9):The relationship between Salinity (Sal.) and Biological Oxygen Demanded (BOD) in west Hammar restored marsh during the 2005,2006,2007 and 2008



Fig(10)

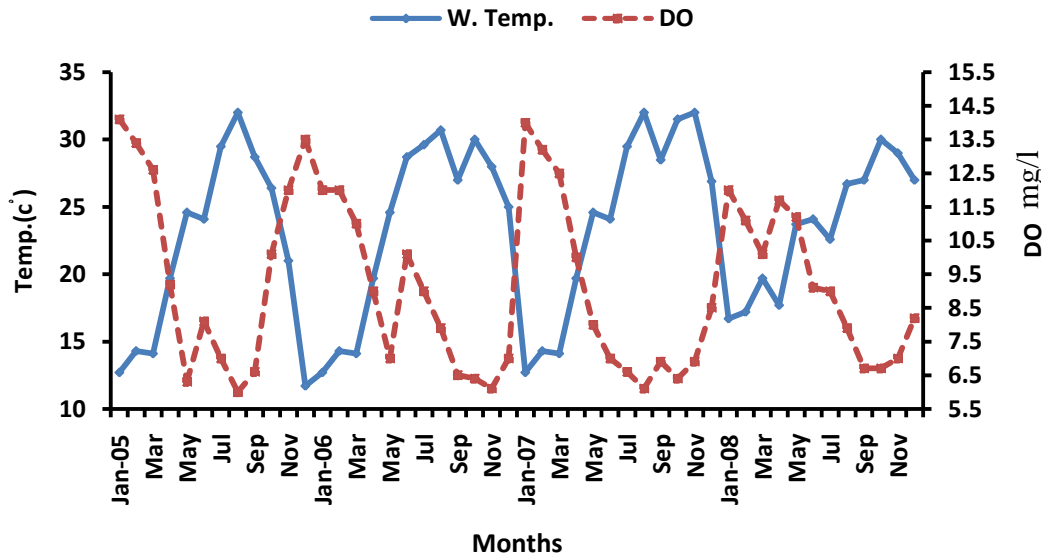
years 2005,2006,2007 and 2008

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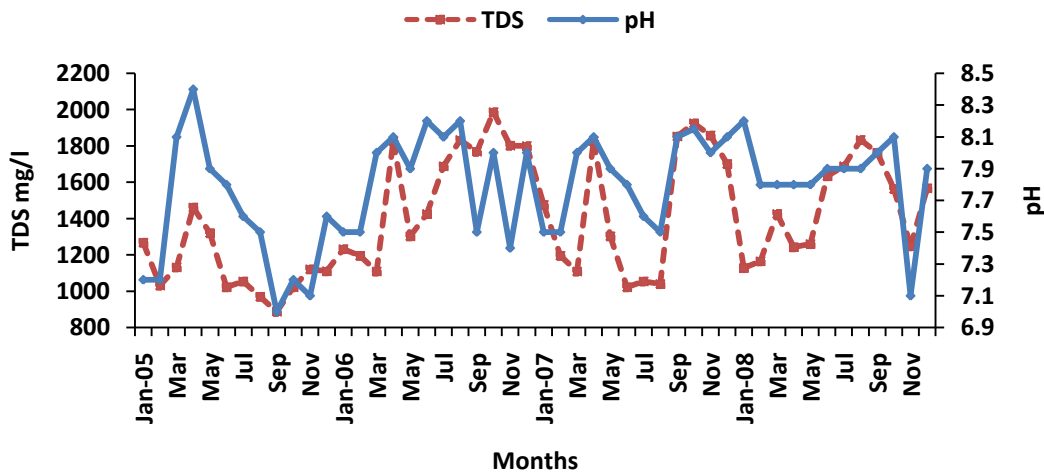


Fig(11) :The relationship between different parameters by using Principal component analysis in west Hammar marsh during the years 2005,2006,2007 and 2008

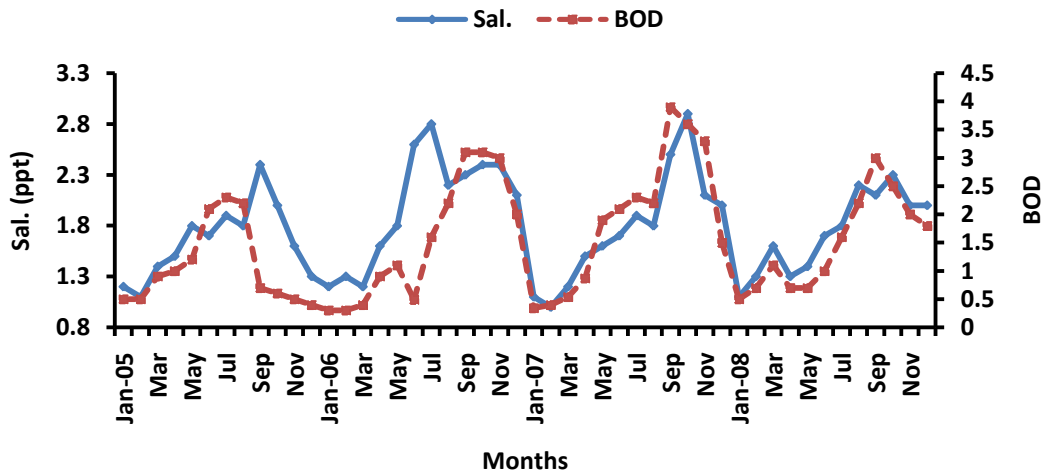
3- Water characteristic of East Hammar



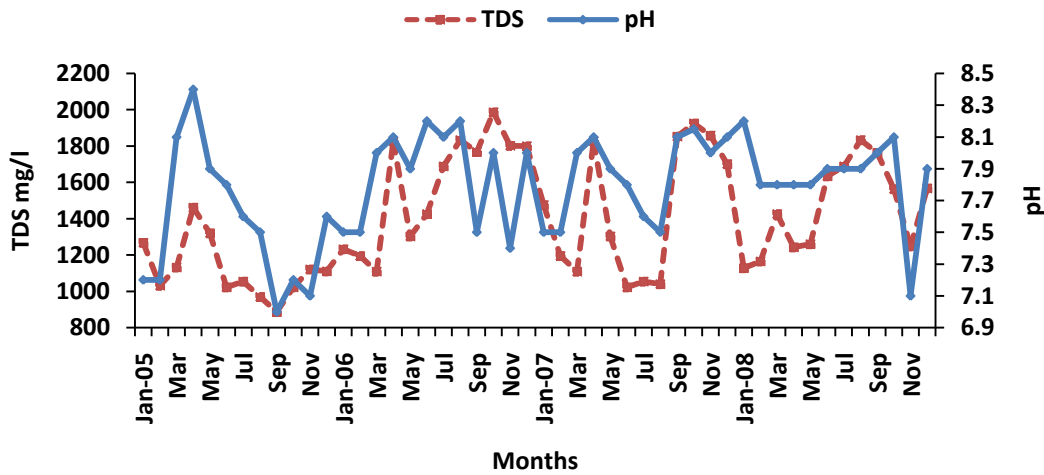
Fig(12):The Relationship between dissolved oxygen(DO) and water temperature Temp.) in East Hammar restored marsh during the years 2005,2006,2007 and 2008



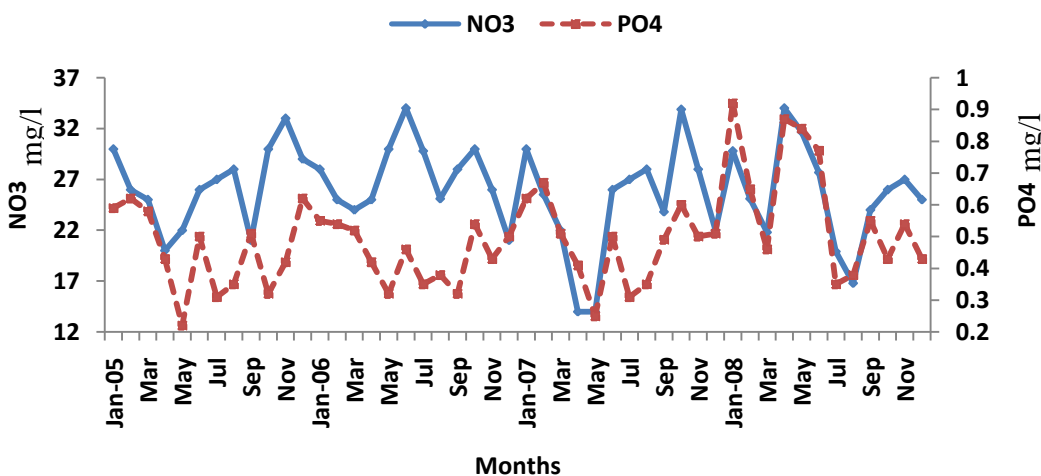
Fig(13): The Relationship between pH and total dissolved solids (TDS) in East Hammar restored marsh during the years 2005,2006,2007 and 2008



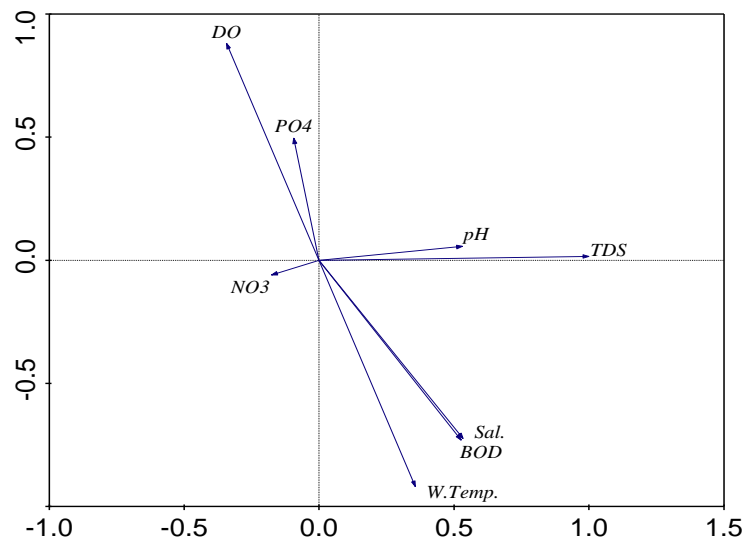
Fig(14). The relationship between Salinity (Sal.) and Biological Oxygen Demand (BOD) in East Hammar restored marsh during the 2005,2006,2007 and 2008



Fig(15): The Relationship between pH and total oxygen demand (TDS) in East Hammar restored marsh during the years 2005,2006,2007 and 2008



Fig(16): The Relationship between nitrate(NO3) and phosphate(PO4) in East Hammar restored marsh during the years 2005,2006,2007 and 2008



Fig(17) :The relationship between different parameters by using Principal component analysis in East Hammar marsh during the years 2005,2006,2007 and 2008

1-The relationship between water temperature and dissolved oxygen.

Figures (2,7 & 12) illustrated the opposite relationship between water temperature and dissolved oxygen in Al-Huwaza ,West and East Hammar marshes , due to the relative shallowness of the marshes and long hot with high air temperature leading to rise of water temperature to reach the thirties.

2-The relationship between Total dissolved solids (TDS) and pH.

In Al-Huwaza marsh two pattern recognized, the first represent mutual relationship that increase or decrease of TDS will be followed by pH values represent the normal relation. the second pattern no pattern exist but more opposite relation ,could be due to more cation salts brought with water

especially during 2008 (dry year) (fig 3) .the same was recognized in West Hammar (fig.8) In East Hammar one pattern appear as in other two marshes with little anomalies during 2008 represent the dominant action of high total dissolved solids (TDS).(fig 13)

3-The relationship between salinity (Sal) and Biological oxygen demand (BOD)

Figures (4 & 9) showed that the increase in salinity values were followed by increase of BOD levels in Al-Huwaza and West Hammar marshes ,it seem that salinity have direct effect on biotic activity through the physiological stress and modifying their habitat and niches .In East Hammar two pattern appear the first a close relation during 2007 &2008 through increase of salinity values followed closely by increase of BOD .The second during 2005 & 2006 were

salinity was lower than that of 2008 consequently the BOD was lower than that of 2007 & 2008 and have its own pattern. (fig. 14)

4- The relationship between Nitrate and phosphate.

In general the concentration of Nitrate was higher than that of phosphate in Al-Huwaza and West Hammar marshes. Phosphate follow up the changes of nitrate with few anomalies in May2005 ,Sep 2006,May 2007 and Sep 2008 in Al-Huwaza (fig.5) .In West Hammar a close relationship appeared between Nitrate and phosphate with similar peaks and declines during 2005,2006 and2007 .In summer 2005& 2008 different style appeared with opposite concentrations i e. higher nitrate with lower phosphate fig.(10) . In East Hammar again nitrate was higher than phosphate except in the first half of 2008 were phosphate higher than nitrate (fig 16).

5- The Principle competent analysis

5-1- Al-Huwaza marsh

Total dissolved solids(TDS) and water temperature were the most important factors controlling water characteristic of Al-Huwaza marsh. In the second rank were Dissolved oxygen(DO) and Biological oxygen demand (BOD) .Fig . (6) demonstrated the opposite co- relation between DO ; W.Temp. and BOD .Other factors play minor roles .

5-2-West Hammar marsh

It seems that Total dissolved salts (TDS),dissolved oxygen and water temperature were the most important factors controlling water characteristic of west Hammar marsh .The salinity and Biological oxygen demand (BOD) coming in second

class. Other factors were less important (fig.11) .

5-3-East Hammar marsh

Water temperature ,TDS and dissolved oxygen were most important factors affecting the water characteristic of east Hammar marsh .The second important factors were salinity and BOD. Other factors were less important (fig.17) .

Discussion:

The three studied marshes were different environmentally ,Al-Huwaza is freshwater marsh ,West Hammar is oligosaline and East Hammar tidal mesosaline marsh (UNEP 2004).

The increase of discharge of water resources entering to the southern marshes will improve the Water quality as happen during 2006 & 2007 were consider the best years in comparison with other years like 2008 . Water resource quantity of southern marshes unstable during the last seven years depend largely on discharge of Tigris ,Euphrates and Shatt Al-Arab rivers and on annual scanty rain fall .

Certain factors play major role in deciding the water characteristic ,these factors were water temperature ,TDS and dissolved oxygen since the later play an important role in marshes environment through the aerobic and non- aerobic conditions which will led to oxidize or reduce reactions .It was known that marsh environment was largely reduce one. TDS which a decisive factor to determine the kind of the marsh and type of the environment either freshwater or saline and also the fauna and flora. In general the water were more saline due to the water polices

exerted by countries of water shed of Tigris ,Euphrates and Shatt Al-Arab rivers.

The water of the marshes spread over vast area with shallow depths which lead to increase of evaporation especially during extended long summer season (over six months) consequently led to increase the salinity and conductivity .

The stagnation of water and weak current in marshes resulted in more time for interaction between the water column and sediments below increasing the concentration of anions and cations in the water column ie. increase importance of TDS. On the other hand the marshes are characterized by their higher primary productivity of phytoplankton and aquatic plants resulting in high dissolved oxygen content in the water column, led to the blooming the microbial activities resulting in depletion of dissolved oxygen increasing the Biological oxygen demand (BOD).

PCA analysis of Al-Huwaza marsh reveals that four factors played the major roles ,these factors were DO ,TDS,WT and BOD.

Al-Saad *et al.*(2010) and Al-Imara (2009a) showed that limiting factors for the marsh environment were dissolved oxygen (DO),pH, salinity, total dissolved solids, total hardness, carbonate ,Na, Cl and k. While Al-Imara (2009b)studied the levels of nutrients and found that phosphate was lower than nitrate.

In general Richardson *et al.*,(2005) summarized the water chemistry of the marshes were different from that of the rivers and lakes of Iraq Nutrients level didn't limit the growth of phytoplankton and saprophytes and emphasis that shallowness play a role in releasing nutrients and ions again to water column to continue the growth.

He emphasis that Tigris ,Euphrates and Shatt Al-Arab were the major sources of water to marshes.

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الخلاصة

درست مواصفات المياه لثلاثة من الأهوار المسترجعة (شرق الحمار والحويزة و غرب الحمار) للأعوام 2005 و2006 و 2007 و 2008. استخدمت ثمانية عوامل لحساب الدليل وهي درجة الحرارة و الملوحة و المواد الصلبة الذائبة و الأوكسجين المذاب و الاس الهيدروجيني و المتطلب الحيوي للأوكسجين و فوسفات و النترات . بين تحليل PCA العوامل المؤثرة الحاكمة لمياه هور الحويزة هي درجة الحرارة الماء و المواد الصلبة الذائبة الكلية و الأوكسجين المذاب. اما في هور غرب الحمار المواد الصلبة الذائبة الكلية و الأوكسجين المذاب و درجة الحرارة الماء. اما في هور شرق الحمار تلعب درجة الحرارة الماء و المواد الصلبة الذائبة الكلية و الأوكسجين المذاب .